Demand response in Flanders, Belgium

Belgium has an electricity-intensive industrial sector and relatively low demand in the residential sector, as electricity is not the dominant energy source chosen for heating purpose [1]. This industrial demand is exploited at the system-operator level for adequacy and balancing purposes. To counteract critical adequacy issues, the Belgian state has instated a capacity mechanism called **strategic reserve** (SR). The SR is a mechanism, enforced by the Belgian legislation, to prevent energy shortages during winter months. This strategic reserve typically operates 'out-of-market', which means that the capacity held as strategic reserve cannot participate in the energy market like any other capacity. It differs from the balancing resources Elia uses all year round to offset the sum of residual imbalances in real time. The continuous imbalance is mitigated by the **demand side response** (DSR) mechanism.

Elia, the Belgian TSO, has introduced a **Consumer-Centric Market Design** (CCMD) [2]. This market design envisions a **demand response** (DR) mechanism for the Belgian prosumers connected to the low voltage distribution grid. Although the technologies needed to enable this demand side participance such as digital meters, cloud connectivity and Internet of Things are available, the DR is not yet available today. There are several barriers which prevent the use and the active participation of small flexibility assets. Behind the meter flexible services are not yet available due to the complexity at hand, e.g.: very complex administration, multiple meters, and compatibility with every supplier.

In 2011, Elia in introduced a market design for industrial demand side response [3]. This created a new ecosystem of flexibility aggregators and allowed industrial consumers to monetize their flexibility. Elia has DR contracts with large industrial customers and aggregators connected to the transmission grid to provide balancing reserves. Today, all parties with at least 1 MW of (aggregated) flexible power can participate in the various balancing products [4]. Elia has multiple Demand Response products, as shown in Figure 1.

Elia's balancing products

The **most important balancing products** are discussed below.

Balancing product (Belgian name)	Common European name	Explanation
Primary control (R1)	Frequency Containment Reserve (FCR)	Continuously monitors the frequency in the grid and will counteract any deviation from the reference frequency (50 Hz in Europe). The full FCR power should be delivered within 30 seconds if necessary. The aim is to limit the frequency deviations so that a collapse (black out) of the system is prevented.
Secondary control (R2)	Automatic Frequency Restoration Reserve (aFRR)	It is controlled centrally by Elia and must be able to be fully activated within 5 minutes. After activation, the system operator sends a new setpoint every 4 seconds, which must be followed within a strict accuracy band. This enables the grid operator to adjust the balance in a precise manner.
Tertiary control (R3)	Manual Frequency Restoration Reserve (mFRR)	Tertiary reserve is used to make the aFRR available again in case of large and prolonged imbalances and must be able to be fully activated within 15 minutes. In case of large imbalances, these reserves can support the mains frequency for minutes to hours.

Figure 1: adapted from[4]

What is needed is a long-term commitment from all stakeholders involved, the design of well-balanced demand response programs, and the definition of clear program objectives as concluded by Elia in their CCMD report [2].

References

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